PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : E01H 5/06, E02F 3/815

A1

(11) International Publication Number: WO 00/31346

(43) International Publication Date: 2 June 2000 (02.06.00)

(21) International Application Number: PCT/SE99/01787

(22) International Filing Date: 6 October 1999 (06.10.99)

(30) Priority Data:
9803843-3 10 November 1998 (10.11.98) SE

(71) Applicant *(for all designated States except US)*: KUNGSÖRS PLAST AB [SE/SE]; Box 70, S-736 22 Kungsör (SE).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: ANDERSSON, Thomas [SE/SE]; Skottvägen 6, S-736 32 Kungsör (SE).

(74) Agents: AXELSSON, Rolf et al.; Kransell & Wennborg AB, Box 27834, S-115 93 Stockholm (SE).

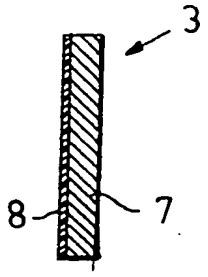
(81) Designated States: AT, CA, CH, DE, FI, NO, PL, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
In English translation (filed in Swedish).

(54) Title: WEARING FOR SNOWPLOUGHS, ROAD SCRAPERS CUTTING EDGE OR THE LIKE

(57) Abstract

Wearing cutting edge for a snowplough, a road scraper or the like, which during use makes contact with a roadway or the like which is provided with a hard surface layer of asphalt, concrete or the like. The wearing cutting edge (3) is made of polyurethane and mounted replaceably along that edge of the snowplough or road scraper which interacts with the road surface. In order to reduce wear on the wearing cutting edge and the road surface, the front part of the wearing cutting edge (3), in the direction of travel, consists of a sacrificial layer (8) made of a softer material than the rest (7) of the wearing cutting edge, which sacrificial layer (8), as it wears, provides material which contributes to lubrication of the rest (7) of the cutting edge.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

WEARING FOR SNOWPLOUGHS, ROAD SCRAPERS CUTTING EDGE OR THE LIKE

The present invention relates to a wearing cutting edge for a snowplough, a road scraper or the like, which during use makes contact with a roadway or the like which is provided with a hard surface layer of asphalt, concrete or the like, which wearing cutting edge is made of polyurethane and mounted replaceably along that edge of the snowplough or road scraper which interacts with the road surface.

As a consequence of the wear which roadways covered with asphalt and concrete cause on, for example, snowploughs and road scrapers, it is necessary, to protect the plough or the scraper itself, to provide the latter with a wearing cutting edge which can be replaced.

As a consequence of the heavy wear, it has been considered necessary to make use of a very hard material, for which reason wearing cutting edges of this type have until now been made of hardened steel. In spite of the hardness of the steel, such a cutting edge is usually worn out after roughly 70-100 kilometres. This means that the driver has to replace wearing cutting edges several times per working period so that the plough will not be destroyed.

Other disadvantages of using a hard wearing cutting edge are very loud noise for the surrounding area and noise and vibrations in the driver's cab resulting in a poor working environment. Furthermore, the hard wearing cutting edges cause major damage to the roadway and especially to lines and road markings on the roadway. Steel cutting edges are also relatively heavy, which results in undesirable extra loading on the front axle of the vehicle.

The object of the present invention was to seek to replace the wearing cutting edges made of steel with wearing cutting edges made of a different material, which

eliminates or significantly reduces the abovementioned problems.

In tests, wearing cutting edges made of polyurethane, which in comparison with steel is a soft material, surprisingly proved to withstand wear considerably better than steel cutting edges and also to eliminate a number of the disadvantages from which steel cutting edges suffer. Examples of such solutions are described in US A 4,590,694 and CH A5 545889.

Tests have shown that the resistance to wear of wearing cutting edges made of polyurethane is at least 10 times better than for steel, which means that a wearing cutting edge made of polyurethane can usually be driven more than 1000 kilometres before it needs to be replaced. As a result of the use of soft material in the wearing cutting edge, noise is drastically reduced, both outside the vehicle and in the driver's cab. Vibrations in the cab are also very considerably reduced. The weight of the wearing cutting edge is significantly lower and the damage caused to the roadway and its lines and road markings is greatly reduced.

In spite of the fact that polyurethane is a more expensive material than steel, a comparison of the total costs shows that the polyurethane cutting edge is superior to the steel cutting edge in terms of cost also.

Polyurethane tolerates both cold and heat relatively well. However, the wear on in particular the cutting edge can be unnecessarily great if it is completely dry between the cutting edge and the roadway. This can give rise to excessive friction-heating of the material in the cutting edge.

According to the present invention, this problem is solved by lubricating the wearing cutting edge. This can

be effected by using a sacrificial layer made of a softer material than the rest of the cutting edge.

According to the present invention, a wearing cutting edge of the type indicated in the first paragraph is characterized in particular in that the front part of the wearing cutting edge, in the direction of travel, consists of a sacrificial layer made of a softer material than the rest of the wearing cutting edge, which sacrificial layer, as it wears, provides material which contributes to lubrication of the rest of the cutting edge.

By making use of this type of wearing cutting edge provided with a sacrificial layer, automatic lubrication of that part which follows the part of the cutting edge provided with the sacrificial layer is achieved without any manual operations. By virtue of effective lubrication of the wearing cutting edge, this can be made of polyurethane without mixing in friction-reducing material which may otherwise weaken it. It is of course possible, and in some cases desirable, to combine a sacrificial layer according to the invention with a wearing cutting edge made of polyurethane with friction-reducing material mixed in.

The sacrificial layer is suitably also made of polyurethane in order that problem-free adhesion is achieved between the layers. A high content of friction-reducing additives is mixed into the sacrificial layer, which are supplied to the cutting edge as the latter wears. Polytetrafluoroethylene, molybdenum disulphide, polyethylene fibres or silicone oil can be used as friction-reducing additives and contribute to lubrication of this part of the wearing cutting edge and thus reduced friction-heating of the same.

The wearing cutting edge with the sacrificial layer can

be fastened to the lower edge of the snowplough or the scraper by means of key joints.

The invention will be described in greater detail below with reference to the embodiments shown by way of example in the appended drawing.

Fig. 1 shows a plough vehicle with a snowplough provided with a wearing cutting edge according to the invention.

Fig. 2 shows the mounting of the wearing cutting edge on the snowplough.

Fig. 3 is a section through a preferred embodiment of a wearing cutting edge according to the invention.

In Fig. 1, reference number 1 designates a plough vehicle with a front plough 2 which is provided, along its lower edge, with a wearing cutting edge 3 made of polyurethane. The wearing cutting edge is suitably divided into a number of sections positioned side by side.

Fig. 2 illustrates how a wearing cutting edge 3 can be mounted on a plough blade 2. The blade 2 is in this connection provided with projecting fastening pins 4, on which a wearing cutting edge 3 provided with holes 5 can be mounted. Fixing is effected by key elements 6 which interact with the mounting pins 4 being driven into the holes 5. This affords rapid, simple and secure mounting and fixing of the wearing cutting edge 3 on the plough blade 4 and also allows simple replacement of wearing cutting edges as required.

According to the present invention, the wearing cutting edge 3 is made of polyurethane which has proved to be significantly more wear-resistant on contact with asphalt and concrete than previously used wearing cutting edges made of hardened steel. As mentioned in the introduction,

a wearing cutting edge made of polyurethane can usually be used for a distance which is at least ten times as long as in the case of a wearing cutting edge made of steel.

The polyurethane material, which is soft in relation to steel, also considerably reduces the wear on road surfaces and road markings painted on these. Noise and vibrations are also reduced when polyurethane cutting edges are used.

In order further to reduce wear by reducing the friction-heating of the wearing cutting edge 3 which occurs in particular on contact with a dry roadway, the polyurethane material in the cutting edge can be filled with a friction-reducing substance, such as polytetrafluoroethylene, molybdenum sulphide, polyethylene fibres or silicone oil. During wear of the cutting edge, these substances will bring about friction-reducing lubrication of the cutting edge. If polytetrafluoroethylene is used, the degree of filling can amount to roughly 10%, while a degree of filling of roughly 0.5% is used when silicone oil is mixed in. However, the content of filler can be varied within wide limits and the expert can establish by simple tests what is suitable for a particular application.

Mixing these substances into the polyurethane material in the wearing cutting edge 3 does mean, however, that the cutting edge is not quite as tough and elastic as when an unfilled polyurethane material is used. As the construction has to have very great mechanical strength, which eliminates the risk of breaking as a result of brittleness, the wearing cutting edge is, according to the present invention, made as illustrated diagrammatically in Fig. 3.

The wearing cutting edge according to Fig. 3 consists of

a main part 7 of unfilled polyurethane material, on which a front part 8, seen in the direction of movement of the cutting edge, made of a softer material is mounted. As the cutting edge 7 wears, the softer layer 8 will also wear and contribute to lubrication of the cutting edge 7.

The softer material in the front layer 8 also suitably consists of polyurethane, which is filled with friction-reducing substances of the type indicated above. By virtue of the fact that both layers are made of the same material, problem-free adhesion can be brought about between the layers. As the cutting edge wears, the front layer 8 will therefore serve as a sacrificial layer which brings about lubrication of the cutting edge as it wears.

With a wearing cutting edge of the type described above in connection with Fig. 3, the mechanical strength of the polyurethane material in the main part 7 of the cutting edge is maintained at the same time as the friction-heating of the cutting edge is reduced as a consequence of the use of a sacrificial layer 8. This results in a wearing cutting edge which is superior in many respects to previously used wearing cutting edges made of hardened steel. The polyurethane material in the main part 7 of the cutting edge can also contain a certain quantity of friction-reducing substances if so desired. However, the content of these can be limited as a result of using a sacrificial layer according to the invention.

A wearing cutting edge 3 according to the invention can have a total thickness of, for example, roughly 20 mm, the sacrificial layer 8 accounting for roughly 2 mm of the total thickness.

The invention has been described above in connection with the embodiment shown in the appended drawings. However, it can be varied in a number of respects within the scope of the patent claims. Therefore, for example, the

thickness of the two layers in the wearing cutting edge can be varied for adaptation to different prerequisites. Furthermore, the material in the sacrificial layer 8 can be exchanged for a different material which satisfies the requirement of bringing about lubrication of the main part 7 of the cutting edge as the latter wears. The mounting of the wearing cutting edge on, for example, a plough blade can of course be varied as desired.

CLAIMS

1. Wearing cutting edge for a snowplough, a road scraper or the like, which during use makes contact with a roadway or the like which is provided with a hard surface layer of asphalt, concrete or the like, which wearing cutting edge (3) is made of polyurethane and mounted replaceably along that edge of the snowplough (2) or road scraper which interacts with the road surface, characterized in that the front part of the wearing cutting edge (3), in the direction of travel, consists of a sacrificial layer (8) made of a softer material than the rest (7) of the wearing cutting edge, which sacrificial layer (8), as it wears, provides material which contributes to lubrication of the rest (7) of the cutting edge.

2. Wearing cutting edge according to Claim 1, characterized in that the sacrificial layer (8) consists of polyurethane with a high degree of filling of a friction-reducing substance, such as polytetrafluoroethylene, molybdenum sulphide, polyethylene fibres or silicone oil.

3. Wearing cutting edge according to Claim 1 or 2, characterized in that the polyurethane material in said rest (7) of the wearing cutting edge (3) is filled with a friction-reducing substance, such as polytetrafluoroethylene, molybdenum disulphide, polyethylene fibres or silicone oil, which contributes to lubrication of this part (7) of the wearing cutting edge (3) and thus reduced friction-heating of the same.

4. Wearing cutting edge according to any one of Claims 1-4, characterized in that it has a total thickness of roughly 20 mm and in that the sacrificial layer (8) accounts for roughly 2 mm of this.

Fig. 2

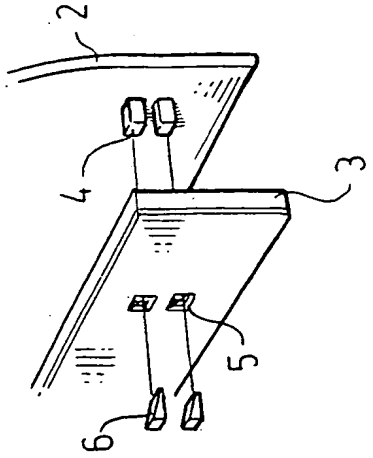


Fig. 3

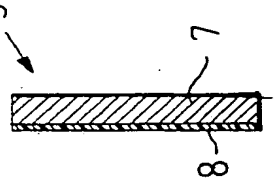
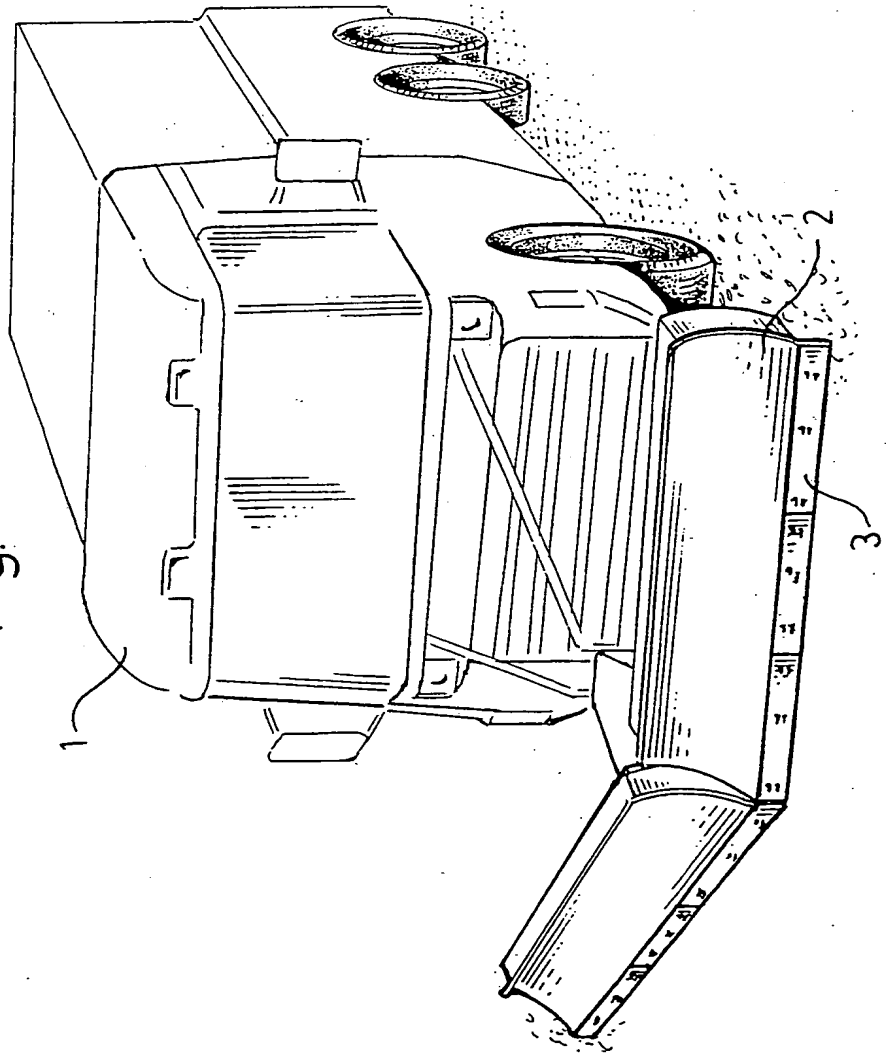


Fig. 1



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/01787

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01H 5/06, E02F 3/815
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E01H, E02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4590694 A (H.P. BLOCK), 27 May 1986 (27.05.86), column 3, line 9 - line 64, figure 8 --	1
A	CH 545889 A (SEMPERIT AKTIENGESELLSCHAFT), 15 February 1974 (15.02.74), column 2, line 57 - column 3, line 16 --	1
A	SE 506764 C2 (P. VAUHKONEN), 9 February 1998 (09.02.98) --	1
A	US 3477149 A (C.H. WAGNER), 11 November 1969 (11.11.69) --	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2000	12 -02- 2000
Name and mailing address of the ISA Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Christer Falk / MR Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/01787

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3465456 A (E.T. MEYER), 9 Sept 1969 (09.09.69) --	1
A	US 5185946 A (E.A. FARRELL), 16 February 1993 (16.02.93) --	1
A	DE 3036892 A1 (STELTER, H.), 13 May 1982 (13.05.82) --	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 99/01787

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4590694 A	27/05/86	CA 1255097 A	06/06/89
CH 545889 A	15/02/74	DE 2403051 A	08/08/74
SE 506764 C2	09/02/98	CA 2153408 A	04/08/94
		FI 679 U	23/04/93
		FI 930032 D,V	22/01/93
		FI 953066 A	21/06/95
		NO 952524 A	20/07/95
		SE 9502641 A	18/07/95
		US 5743032 A	28/04/98
		WO 9417248 A	04/08/94
US 3477149 A	11/11/69	NONE	
US 3465456 A	09/09/69	NONE	
US 5185946 A	16/02/93	CA 2029602 A,C	24/10/91
		US 5079866 A	14/01/92
DE 3036892 A1	13/05/82	NONE	